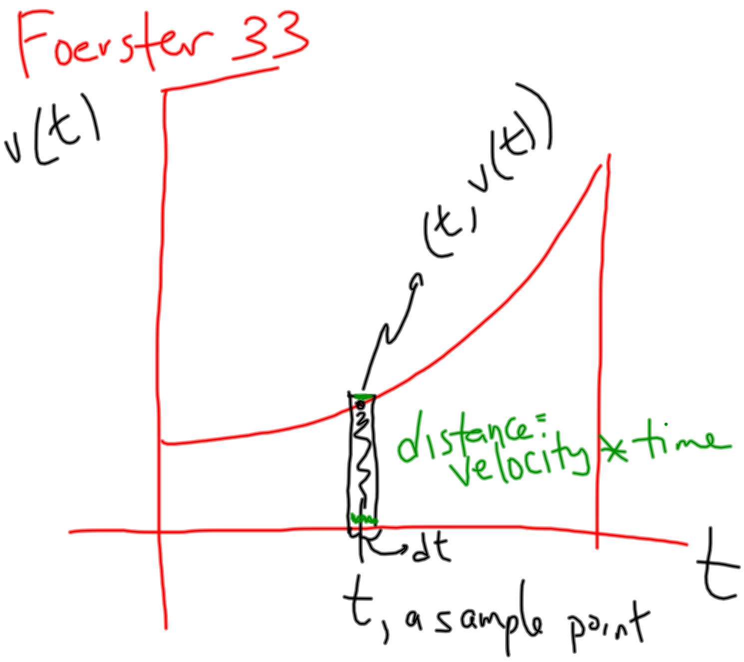

Foerster 33
v(t)
(t, v(t))
distance = velocity * time
dt
t
t, a sample point

7)

$$v(t) = 3000 + 18t^{1.4} = 26000$$

(fps)

$$18t^{1.4} = 23000$$

$$t^{1.4} = \frac{23000}{18}$$

$$t = \left(\frac{23000}{18}\right)^{\frac{1}{1.4}} \approx 166$$

sec

6) distance = $\int_0^{100} 3000+18t^{1.4}\,dt$

fnInt(3000+18X^(1.4),X,0,100) = 773,218.008 feet

= 733,000 ft

sum(seq(~, X, low, hi))

$\boxed{8}$ dist = $\int_0^{166} f(t)\,dt$

Foerster 33
#9

$$\int_a^b f(x)\,dx \quad \text{vs} \quad \int_a^b f(x)$$

* like multiplying value of f^n by width
* so you know what the important variable is
* status quo, yo

$$\lim_{\max \Delta x_k \to 0} \sum_{k=1}^{n} f(x_k^*) \Delta x_k =$$

$$\int_a^b f(x)\, dx$$

"thought" explanation

1) Adding up all the little-itty-bitty values of the function

eg. avg value of f(x) over [a,b]

$$= \frac{1}{b-a} \int_a^b f(x)\, dx$$

2) Multiplying variable-function by the base

$$\lim_{\max \Delta x_k \to 0} \sum_{k=1}^{n} f(x_k^*) \Delta x_k \qquad \left[\int_a^b f(x)\, dx \right]$$

this does <u>not</u>

goes <u>to</u> 0

6.7) Rectilinear Motion revisited

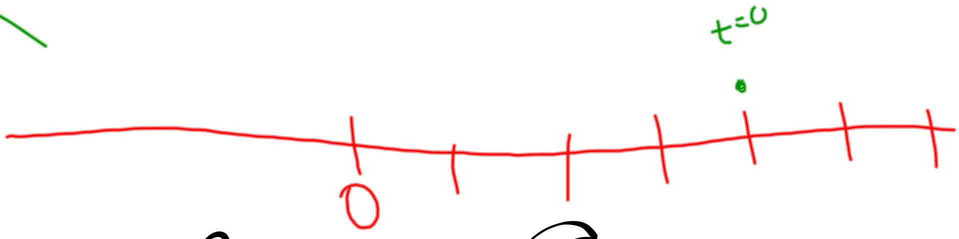
$s(t) = \text{position}$ | $v(t) = s'(t)$ | $a(t) = v'(t) = s''(t)$

$s(t) = \int v(t)\,dt + C_2$

$v(t) = \int a(t)\,dt + C_1$

$a(t)$

Find the position function of a particle that moves along a coordinate line with $V(t) = \cos(\pi t)$ & that begins at $s = 4$ when $t = 0$



$S(t) = \int \cos(\pi t)\, dt$

$\int \cos u \left(\frac{1}{\pi} du\right)$ Let $u = \pi t$

$\frac{du}{dt} = \pi$

$= \frac{1}{\pi} \int \cos u\, du$

$du = \pi\, dt$ "$g'(x)$"

$= \frac{1}{\pi} \sin u + C$

$\frac{1}{\pi} du = dt$

$= \frac{1}{\pi} \sin(\pi t) + C$

$\frac{d}{dx}(f(g(x))) = f'(g(x)) \cdot g'(x)$

6.7/1-10

$$s(t) = \frac{1}{\pi}\sin(\pi t) + C$$

but I know that

$$s(0) = 4$$

$$s(0) = \frac{1}{\pi}\sin(\pi(0)) + C$$

$$= 0 + C = 4$$

$$\therefore C = 4$$

$$s(t) = \frac{1}{\pi}\sin(\pi t) + 4$$

I drop Spencer from a 100m tower.
what is a function that tells me what Spencer's distance fr ground is?

constant $a(t) = -9.8 \ m/sec^2$

$V_0 = v(0) = 0$

$S_0 = s(0) = +100$

$v(t) = \int a(t)\,dt = \int -9.8\,dt = -9.8\int 1\,dt$

$= -9.8t + C$

$v(0) = -9.8(0) + C = V_0$

$v(t) = -9.8t + V_0$

$s(t) = \int v(t)\,dt = \int -9.8t + V_0\,dt$

$= -9.8\frac{t^2}{2} + V_0 t + C$

$S_0 = S(0) = -9.8\left(\frac{0^2}{2}\right) + V_0(0) + C = 100$

$s(t) = -9.8\left(\frac{t^2}{2}\right) + \overset{0}{V_0}t + \overset{100}{S_0}$

HW / 6.7 / 1-10

6.6/61

$$\int_0^3 \sqrt{x^3+2}\,dx$$ bounds

$f(x)=\sqrt{x^3+2}$

$f(0)=\sqrt{0^3+2}=\sqrt{2}$; $f(3)=\sqrt{3^3+2}=\sqrt{29}$

since, on $[0,3]$, $\sqrt{2}\le\sqrt{x^3+2}\le\sqrt{29}$

so

$$\sqrt{2}(3-0)\le\int_0^3\sqrt{x^3+2}\,dx\le\sqrt{29}(3-0)$$

$$4.243\le\int_0^3\sqrt{x^3+2}\,dx\le 16.155$$

Foerster 33 - #9

$$\int f(x)\,dx \quad \text{VS} \quad \int f(x)$$

* shows with respect to
* easier w/ u-substitution

evaluate vs antiderive

$$\lim_{\max \Delta x_k \to 0} \sum_{k=1}^{n} f(x_k^*)\,\Delta x_k =$$

$$\int_a^b f(x)\,dx$$

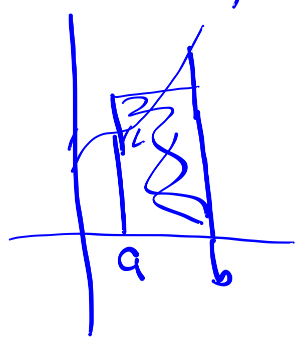
"thought" explanation

1) Adding up all the individual function values

Avg value of $f(x)$ on $[a,b]$

$$= \frac{1}{b-a}\int_a^b f(x)\,dx$$

(2) Multiplying the changing function value by width



$$\lim_{n \to \infty} \sum_{k=1}^{n} f(x_k^*) \Delta x_k$$

Add a product ~~thing~~ 2 things

does not

goes to 0

6.7) Rectilinear Motion revisited

$s(t) =$ position

$v(t)$ velocity $= s'(t)$

$a(t) =$ acceleration $= v'(t) = s''(t)$

$s(t) = \int v(t)\,dt$

$= \int \int a(t)\,dt$

$v(t) = \int a(t)\,dt$

Find the position f^n of a particle moving along a coordinate axis with velocity $v(t) = \cos(\pi t)$ if the particle starts at $s=4$ at $t=0$

position

$t=0$

0

$f(g(x))' = f'(g(x)) \cdot g'(x)$

$$s(t) = \int v(t)\,dt$$

$$= \int \cos(\pi t)\,dt \Rightarrow \int \cos u \left(\frac{1}{\pi}du\right)$$

Let $u = \pi t$

$$\frac{du}{dt} = \pi$$

$$du = \pi\,dt$$

$$\frac{1}{\pi}du = dt \text{ " } g'(x) \text{ "}$$

$$= \frac{1}{\pi}\int \cos u\,du$$

$$= \frac{1}{\pi}\sin u + C$$

$$= \frac{1}{\pi}\sin(\pi t) + C$$

$$s(t) = \frac{1}{\pi}\sin(\pi t) + C$$

$$s(0) = \frac{1}{\pi}\sin(\pi \cdot 0) + C = 4 \quad \therefore C = 4$$

$$s(t) = \frac{1}{\pi}\sin(\pi t) + 4$$

acceleration

I drop Shelby from a 100m tower

$a(t) = -9.8$

$v(t) = \int a(t)\,dt = \int (-9.8)\,dt$

$= -9.8t + V_0$

$s(t) = \int v(t)\,dt = \int -9.8t + V_0\,dt$

$= -9.8\frac{t^2}{2} + V_0 t + S_0$

$Shelby(t) = -9.8\frac{t^2}{2} + 100$